AMENDMENTS

Amendments to the Specification:

Please replace the title with the following amended title:

LOW POWER SHARED LINK ARBITRATION

Please replace paragraph [001] with the following amended paragraph:

[001] Embodiments of the invention generally relate to an interconnect in a networked environment. More particularly, an aspect of an embodiment of the invention relates to an interconnect having an arbitration controller to implement an arbitration policy that minimizes power consumption.

Please replace paragraph [004] with the following amended paragraph:

[004] In some previous common bus techniques, when the first initiator network resource communicates a data payload across the common data bus to the second target network resource, not only will the direct pathway between the initiator and target have a voltage transition but most of the lines and pathways associated with that data bus may also transition their ~~of~~ voltage levels at the same time. In this prior approach used by shared interconnects and buses, generally there has been little effort made to reduce voltage transitions on conductive pathways not directly involved in the transaction transfer between the initiator network resource and the target network resource.

Please replace paragraph [007] with the following amended paragraph:

[007] Further, some system on chip designs are beginning to suffer potential performance problems because of the physical distance traveled on the chip for a fully combinational initiation of a request and payload transmission occurring in the same cycle. For a single cycle arbitration and payload transfer, the initiator sends a request

from its location on the chip to the arbitration controller. The arbitration controller conducts an arbitration of all of the requests being presented to select a winning request. The arbitration controller, from its location on the chip, sends back the response granting the request to the initiator. The initiator sends the payload of information from its location on the chip across the interconnect to the target network resource at its location on the chip. All of these steps occur in the same cycle. The signals travel a physical distance multiple times to and from the arbitration controller and once from the initiating network resource across the interconnect to a target network resource. A measurable amount of time takes place for the electrons to travel that ~~all that~~ distance. Thus, the speed of the clock clocking that particular circuit may be capped to a maximum amount so that a worst case physical distance needed to travel by the electrons across the chip can occur within a single cycle. The worst case physical distance needed to travel by the electrons across the chip can limit how fast the clock speed a particular chip may operate at.

Please replace paragraph [008] with the following amended paragraph:

[008] Various methods and apparatuses are described in which an interconnect couples to a plurality of initiator network resources and a plurality of target network resources. The interconnect may include a first stage of circuitry, a second stage of circuitry, and an arbitration controller. The first stage of circuitry receives incoming transactions from the plurality of initiator network resources. The second stage of circuitry passes outgoing transactions to the plurality of target network resources connecting to the interconnect. The arbitration controller arbitrates transactions from the plurality of initiator network resources destined to one or more of the target network resources. The target network resources supply their availability to service a transaction to the arbitration controller. The arbitration controller implements an arbitration policy that filters out transactions ~~from the arbitration process those transactions~~ from initiator network resources ~~destine~~ to target network resources that are currently not available to service a transaction.

Please replace paragraph [0012] with the following amended paragraph:

[0012] In general, various methods and apparatuses are described in which one or more initiating network resources present a transaction to be serviced by an available target network resource while minimizing the power consumed by routing paths not directly involved in transaction transfer between the initiator network-resource and the target network-resource. One or more initiator network resources present a transaction, such as a request, reply, etc., to an arbitration controller on an initial cycle. The arbitration controller determines a destination associated with a target network resource for each presented transaction. The arbitration controller cross-references the presented transactions from the initiator network resources with target network resources that are currently not available to service a transaction. The arbitration controller filters out presented transactions ~~from the arbitration process destine~~ to target network resources that are currently not available to service a transaction. The arbitration controller implements an arbitration process among the remaining presented transactions to select a presented transaction from an initiating network resource to an available target network resource that wins the arbitration. The arbitration controller may determine actions in this cycle that will take effect in next cycle by storing the results of the arbitration process in control flip flops. The arbitration controller configures segmentation of the pathways in the shared interconnect so that the control flip flops store the control information resulting from the arbitration process. In the next cycle, the arbitration controller establishes a connection with the control signals in the interconnect between the initiator network resource and the available target network resource that won the arbitration. The arbitration controller configures segments of the pathways in the interconnect path to pass the winning presented transaction from the initiator network resource to the target network resource while isolating other segments of the pathways in the interconnect not part of the transaction transfer between the initiator network-resource and the target network-resource. The arbitration controller may have a first stage of circuitry to receive incoming transactions from the plurality of initiator network resources and a second stage of circuitry to pass outgoing transactions to target network resources connecting to the interconnect.

Please replace paragraph [0017] with the following amended paragraph:

[0017] The arbitration controller mechanism 206 arbitrates transactions from the plurality of initiating network resources 202-204 destined to one or more of the target network resources 210-212. Each initiator network resource 202-204 on any given cycle may present a transaction to be arbitrated via sending a request and identifying the target with identifying target information within that request. The arbitration controller 206 implements the arbitration policy and filters out transactions from the arbitration process from initiator network resources 202-204 that have destinations to target network resources 210-212 that are currently not available to service a transaction. The arbitration controller 206 receives the arbitration request and the target information via the control lines 230. Each ~~Target Network Resource~~ target network resource 210-212 sends its flow control information identifying whether it's ready to service a transaction or not, to the arbitration controller 206 via the control lines 230. After the arbitration controller 206 identifies which targets are destined to be sent a transaction, the arbitration control mechanism 206 determines whether that target network resource can currently service a transaction. If a target network resource is not ready to service a transaction, then the presented transactions ~~destine~~ destined to that target network resource are eliminated from the pool of presented transactions to be arbitrated prior to conducting the arbitration algorithm. After the filtering, the arbitrator 206 may then implement an arbitration algorithm such as a round robin, priority based, least recently serviced, or other type of arbitration algorithm. The target network resources 210-212 may provide their flow control information on a continuous basis with a signal to the arbitrator 206 letting the arbitration controller mechanism 206 know whether that target network resource can service a transaction. Alternatively, the target network resources 210-212 can relay their flow control information to the arbitration controller 206 in response to receiving a request signal from one of the initiator network resources 202-204. The arbitration controller 206 implements the arbitration policy and determines which initiator network resource of all the network resources presenting transactions on that given cycle wins the arbitration for that particular cycle.

Please replace paragraph [0024] with the following amended paragraph:

[0024] In block 306, the arbitration controller filters out presented transactions from the arbitration process destined ~~destine~~ to target network resources that are currently not available to service a transaction. The arbitration controller implements an arbitration process among the remaining presented transactions to select a presented transaction from an initiating network-resource to an available-target network resource that wins the arbitration. The arbitration controller communicates to each of the initiator network resources whether that network resource won the arbitration or not.

Please replace paragraphs [0032]-[0033] with the following amended paragraphs:

[0032] The wires and conductive paths associated with the second filter unit 441 to the nth filter unit 460 does ~~did~~ not transition the voltage level on their output. Therefore, those conductive paths do not need to be recharged, nor does ~~did~~ any leakage current occur in the conductive paths adjacent to those conductive paths because no transitioning of voltage levels occurs ~~occurred~~ on those conductive paths. Thus, the interconnect merely transitions ~~transitioned~~ in voltage level the conductive paths ~~that needed~~ to be transitioned in order to communicate the payload information from an initiator network resource to a target network resource that is ~~was~~ ready to service that initiator network resource. The reduction of lines transitioning in voltage level and minimization of leakage current saves power expended in a battery powered device.

[0033] The filter units and other components for the other segmented pathways 437, 438 work similarly as described in the example for the first segmented pathway 436. The filter units may be composed of a logical AND gate or latch or other combination of logic components to create a filtering function.[[.]] The merger unit may be composed of a multiplexer and latch or other combination of components to create a selective switch function. If the filter units set all signals to zero when the filter is turned off, the merge units can just be OR gates. Alternatively, each filter unit and merger unit may contain a latch to hold the value of the downstream output wire to the previous value.

Please replace paragraph [0035] with the following amended paragraph:

[0035] Figure 5 illustrates a block diagram of an embodiment of an outgoing transaction circuitry. The outgoing transaction circuitry 528 includes a plurality of splitter units 560-565 and control flip-flops 568-573 associated with each of the splitter units. Each of the control flip-flops 568-573 receives a control signal from the arbitration controller. Each of the control flip-flops 568-573 receives its control signal from the arbitration controller on the initial cycle. Each of the splitter units 560-565 receives an input signal from the bus lines of the splitter unit immediately prior to that splitter unit, except for the initial splitter unit, which receives the payload information from the output of the incoming transaction circuitry. Each of the splitter units 560-565 has two or more outputs. Each of the splitter units, except for the initial splitter unit, connects the two outputs as follows. One output connects to the output terminal and then to a particular target network resource via that output terminal. The second output connects to the next adjacent splitter unit and acts as an input for that splitter unit. Note, the splitter units could have more than two outputs or be arranged in different topologies. As ~~as~~ indicated before the topology outgoing transaction circuitry is merely an example.

Please replace paragraph [0041] with the following amended paragraph:

[0041] Separating the arbitration process and transmission of the payload of information into two discreet actions occurring on two or more different cycles can increase the maximum clock speed that the chip operates on. If the arbitration process and transmission of the payload of information is separated into two discreet actions occurring on two or more different cycles, only half the worst case physical distance needs to be traveled on any given cycle. On the first cycle, all the initiators may present their transactions, which will physically travel from the initiator to the arbitration controller, the arbitration controller implements the arbitration policy and communicates back to the initiator whether it has won or not won the arbitration process. On the next cycle, the winning initiator network resource transmits the payload information through the interconnect via the already configured segmented pathways to the target network

resource. The electrons associated with the information payload transfer merely travel the physical distance between the initiator and the target network resource ~~Target Network Resource~~ via the interconnect without any other actions needing to occur during that cycle.